REMARKS

This is a response to the ***Final Office Action*** dated May 21, 2003. Claims 2-9 and 11-13, 20, and 21-28 remain in the application and claims 22-28 have been allowed. Reconsideration and allowance of outstanding claims 2-9, 11-13, 20, and 21 in view of the following remarks are requested.

The Examiner has rejected claims 4 and 20 under 35 USC §103(a) as being unpatentable over U.S. patent number 6,373,114 to Jeng et al. ("Jeng"). For the reasons discussed below, Applicant respectfully submits that the present invention, as defined by independent claim 20, is patentably distinguishable over Jeng.

The present invention, as defined by independent claim 20, teaches, among other things, "a gate electrode directly overlying the diffusion barrier layer, said gate electrode layer comprising a semiconductor material." As disclosed in the present application, utilizing silicon germanium, i.e. a semiconductor material, in a gate of a device allows a lower anneal temperature to be utilized to activate dopants in the channel region of the device, which can reduce or eliminate an undesirable interfacial layer that can form between the dielectric layer and the channel region at high annealing temperatures. As a result, the present invention advantageously achieves reduced leakage current in the channel and increased device operating speed.

In contrast to the present invention as defined by independent claim 20, Jeng does not teach, disclose, or suggest "a gate electrode directly overlying the diffusion barrier layer, said gate electrode layer comprising a semiconductor material." Jeng specifically

discloses silicon layer 56, which is formed over gate dielectric layer 54 and can be in situ doped for conductivity, and barrier film 58, which is formed over silicon layer 56, i.e. gate poly. See, for example, column 4, lines 23-43, column 7, lines 5-14, and Figure 7 of Jeng. Thus, in Jeng, barrier film 58 is situated over gate poly, i.e. silicon layer 56, which serves as a gate electrode in patterned gate structure 66. In Jeng, metallic layer 60, which can comprise any of a number of highly conductive materials containing metal, is formed over barrier film 58 and is electrically connected to gate poly 56, i.e. the gate electrode, by barrier film 58. See, for example, column 5, lines 45-48, column 7, lines 7-14, and Figure 7 of Jeng. Thus, in Jeng, metallic layer 60 provides a means of interconnecting to gate poly 56, i.e. the gate electrode. Thus, in Jeng, a barrier layer, i.e. barrier film 58, is situated over the gate electrode, i.e. gate poly 56. Moreover, Jeng does not teach, disclose, or suggest a gate electrode directly overlying a diffusion barrier.

For the foregoing reasons, Applicant respectfully submits that the present invention, as defined by independent claim 20, is not suggested, disclosed, or taught by Jeng. As such, independent claim 20 is patentably distinguishable over Jeng. Thus claims 2-9 depending from independent claim 20 are, *a fortiori*, also patentably distinguishable over Jeng for at least the reasons presented above and also for additional limitations contained in each dependent claim.

The Examiner has further rejected claims 11-13 and 21 under 35 USC §103(a) as being unpatentable over U.S. patent number 6,353,249 to Boyd et al. ("Boyd"). For the

reasons discussed below, Applicant respectfully submits that the present invention, as defined by independent claim 21, is patentably distinguishable over Boyd.

The present invention, as defined by amended independent claim 21, teaches, among other things, "a well, said well comprising two silicon germanium filled spaces," "wherein said two silicon germanium filled spaces comprise respective source/drain regions of second conductivity type, said respective source/drain regions being situated on opposite sides of the channel region." As disclosed in the present application, portions of a well are removed by, for example, etching away portions of the wall. The spaces that are left by the removed portions of the well are then filled with silicon germanium to form source/drain regions. Since the source/drain regions are formed by removing portions of the well, the size of the source/drain regions in the present invention can be advantageously controlled by controlling the amount of material that is removed from the well. Additionally, by filling removed portions of the well with silicon germanium to form source/drain regions, the present invention advantageously achieves source/drain regions that can comprise a different material than the well. For example, the well can comprise silicon while the source/drain regions can comprise silicon germanium. Furthermore, by utilizing silicon germanium to form source/drain regions, the present invention allows a lower annealing temperature to be used to activate dopants in the channel region. As a result, the present invention advantageously prevents diffusion between the source/drain regions of the device from destroying the channel.

In contrast to the present invention as defined by independent claim 21, Boyd does not teach, disclose, or suggest "a well, said well comprising two silicon germanium filled spaces," "wherein said two silicon germanium filled spaces comprise respective source/drain regions of second conductivity type, said respective source/drain regions being situated on opposite sides of the channel region." Boyd specifically discloses utilizing conventional ion implantation and annealing to form source/drain regions 32 in substrate 10. See, for example, column 7, lines 16-19 and Figure 1G of Boyd. Thus, in Boyd, since source/drain regions 32 are formed in substrate 10, source/drain regions 32 are necessarily formed in the same material that substrate 10 comprises. Moreover, Boyd does not teach, disclose, or suggest forming spaces in a well, or even a substrate, and filling the spaces with silicon germanium to form source/drain regions.

For the foregoing reasons, Applicant respectfully submits that the present invention, as defined by independent claim 21, is not suggested, disclosed, or taught by Boyd. As such, independent claim 21 is patentably distinguishable over Boyd. Thus claims 11-13 depending from independent claim 21 are, *a fortiori*, also patentably distinguishable over Boyd for at least the reasons presented above and also for additional limitations contained in each dependent claim.

Based on the foregoing reasons, the present invention, as defined by independent claims 20 and 21, and claims depending therefrom, is patentably distinguishable over the art cited by the Examiner. Thus, claims 2-9, 11-13, and 20-21 are patentably distinguishable over the art cited by the Examiner. For all the foregoing reasons, an early allowance of outstanding claims 2-9, 11-13, and 20-21 and an early Notice of Allowance for all claims 2-9, 11-13, and 20-28 is respectfully requested.

Respectfully Submitted,
FARJAMI & FARJAMI LLP

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Michael Farjami, Esq.
Reg. No. 38, 135

Michael Farjami, Esq.
FARJAMI & FARJAMI LLP
16148 Sand Canyon
Irvine, California 92618
Telephone: (949) 784-4600
Facsimile: (949) 784-4601

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